

3M™ Matrix Resin 2896

Technical Data Sheet

Description

3M™ Matrix Resin 2896 (AMD-784-2) is a one part, high-performance, epoxy matrix resin for use in the fabrication of carbon fiber composites by resin transfer molding. 3M™ Matrix Resin 2896 (AMD-784-2) shows higher fracture toughness performance and higher service temperature compared to other typical one part RTM Resins.

3M™ Matrix Resin 2896 (AMD-784-2) contains a curative and is ready to use.

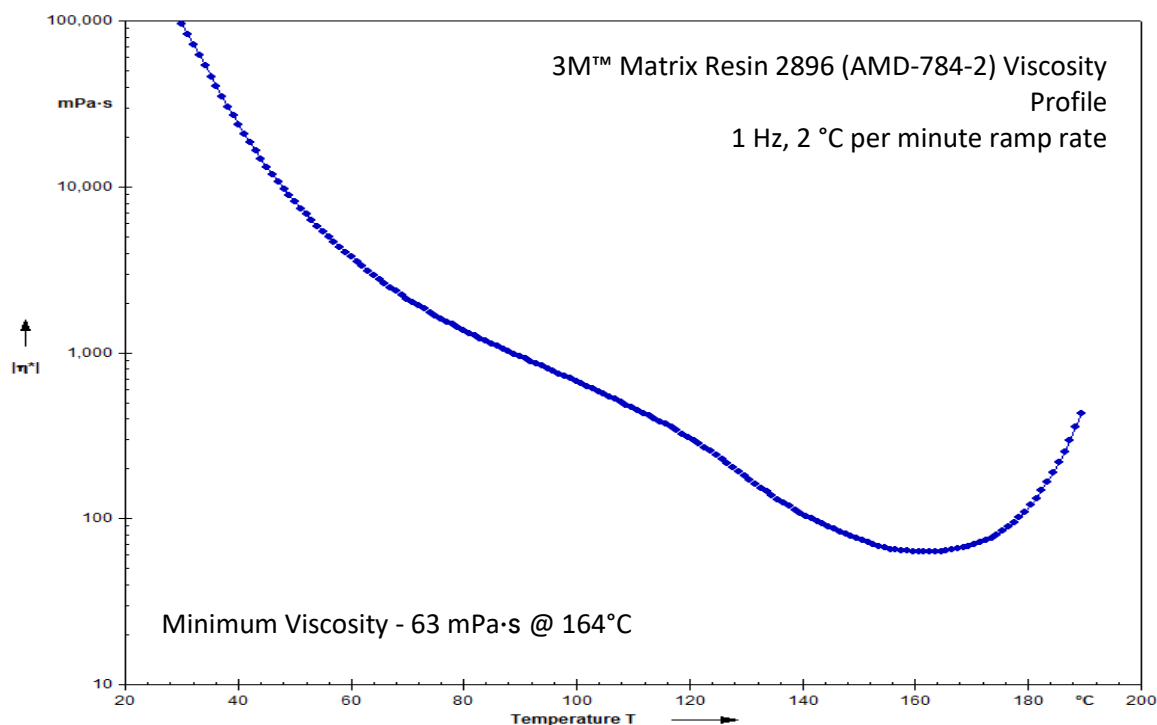
Performance Characteristics

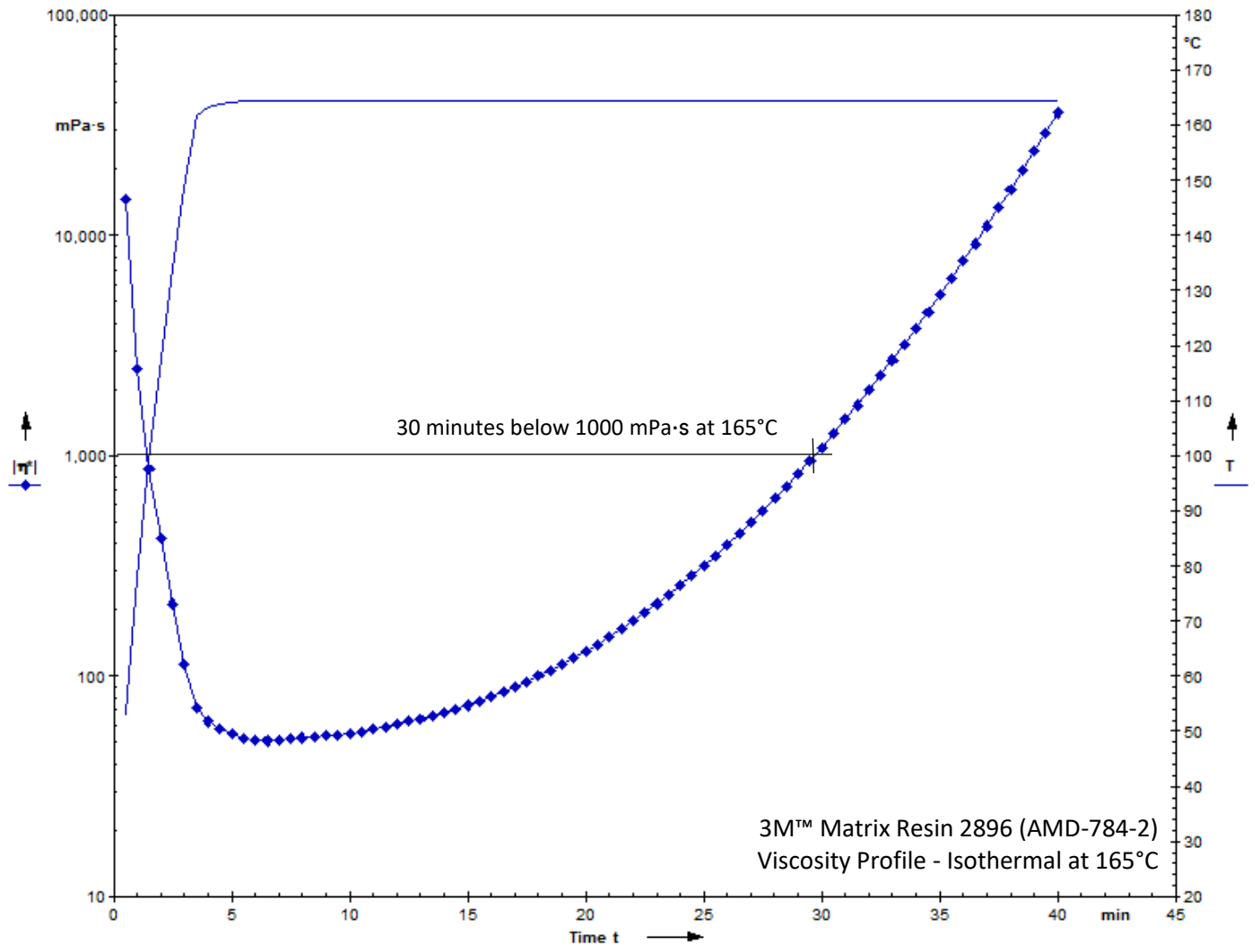
Resin	Toughness	Service Temp	Compression Strength	Applications
2894	+	-	+	Low cost aerospace grade RTM resin
2895	++	+	+	Improved service temperature and toughness
2896	+	++	+	Balanced service temperature/toughness
2897	++	++	+	Highest toughness / service temperature
4891	+	++	++	Structural parts requiring high compression strength from added nanosilica

Typical Resin Flow Properties

The complex viscosity was measured at 1 Hz with a temperature ramp of 2°C/min. Under these conditions, the minimum viscosity is XX cps at a temperature of XXX°C.

A resin viscosity below 1000 mPa·s is sufficient to allow for flow through typical fiber pre-form in an RTM mold. A processing temperature of 163°C (± 5°C) is recommended. In this range, the resin viscosity remains below 1000 mPa·s for approximately XX minutes. This can be considered a guideline for ensuring complete filling of the fiber pre-form.





Typical Cured Neat Resin Properties

	Test Method	3M™ Matrix Resin 2896 (AMD-784-2)
Minimum Viscosity (cPs)	3M internal method (Eta Viscosity, η^*)	62
Fracture Toughness K_{1c} (MPa- \sqrt{m})	ASTM D5045 (Compact tension)	1.86
Tensile Modulus GPa (ksi)	ASTM D638	2.7 (392)
Tensile Strength MPa (ksi)		84 (12)
Tensile Strain to failure (%)		7.0
Glass Transition Temperature (°C)	ASTM D3418-08	187

Typical Composite Properties

Composite test panels made with 5HS Fabric IM7 fiber with appropriate lay-up.

Typical fiber volume in the range of 57-60%

	Test Method	Test Temp (°C)	3M™ Matrix Resin 2896 (AMD-784-2)	
			Dry	Hot/Wet*
Combined Load Compression Strength MPa (ksi)	ASTM D6641-14	23	632 (92)	552 (80)
		120	418 (61)	357 (52)
		150	337 (49)	249 (36)
Interlaminar Shear Strength MPa (ksi)	ASTM D2344-13	23	74.2 (10.8)	64.3 (9.3)
		120	44.4 (6.4)	33.4 (4.8)
		150	30.6 (4.4)	17.5 (2.5)
Open Hole Compression Strength MPa (ksi)	ASTM D6434-14	23	299 (43)	224 (32)
		135		171 (25)
Fracture Toughness by GIIC (J/m ²)	3M Internal Method	23	1112	

*conditioned at 85°C/85% RH

General Process Conditions

3M™ Matrix Resin 2896 is a one part resin system with a dispersed curative. The curative melts upon heating. Proper processing of the resin is critical to ensure that the curative is fully melted and mixed while being injected into the part.

- The product is a white thick paste at room temperature. Upon heating the resin viscosity is reduced and is easily pumped and infused into the fiber preform
- The resin can be heated to 60-65°C to facilitate transferring the resin
- The resin should be degassed at a temperature of 100°C under vacuum with agitation for typically 15-30 minutes.
- The resin has a pot-life of 5 hours at 100°C
- Resin injector reservoir and inlet tubing should be maintained at least 100°C during the injection process. Alternatively, the inlet tubing can be held at a higher temperature no greater than 163°C (± 5°C)
- It is important that the resin reaches a minimum temperature of 163°C before entering the fiber preform. This can be ensured by the use of a heat exchanger or a tool with channels that provide sufficient area for heating the resin prior to entering the fiber preform. Consult with 3M for details on tooling design.
- Successful RTM processing usually involved the maintenance of high vacuum in the tool prior to resin infusion. The tool should be maintained at 163°C (± 5°C) during resin infusion. Consult with 3M for additional processing details.
- After the fiber preform is fully infused with resin and at full pressure (typically 5 -7 bar), resin cure is initiated by heating the tool to 190°C (± 5°C). Full pressure should be maintained for at least 30 minutes at this temperature.
- Full resin cure is complete after 120 minutes at 190°C.

Shelf Life and Storage

Shelf life is two years from date of manufacture under proper storage conditions. The product should be stored frozen below -18°C. It is acceptable to allow the resin to be stored at room temperature (23-25°C) for approximately 30 days. As the storage temperature increases, this out-time will decrease.

Developmental Status Notice

This 3M product is a developmental product. It is currently available on a limited basis and is only provided for technical evaluation. The future availability, formulation, performance properties, and pricing of the material are not guaranteed and are subject to change. To discuss your evaluation, please contact your local 3M Technical Service Representative.

Additional Information

In the U.S. call toll free 1-800-235-2376, or fax 1-800-435-3082 or 651-737-2171. For U.S. Military, call 1-866-556-5714. If you are outside of the U.S., please contact your nearest 3M representative.

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Automotive & Aerospace Solutions Division
3M Center
St. Paul, MN 55144-1000
Phone 1-800-328-1684
Web www.3M.com/aerospace

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